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species. H2AX differs from the other two H2A proteins, H2A1-H2A2 and H2AZ, by the presence of a conserved motif at the C-terminus (Mannironi et al., Nucleic Acid Research, 17, 9113-9125 (1989)). Preferably, the C-terminus of the H2A histone protein of the present invention comprises the amino acid sequence SQ(D/E/A)(I/L/Y/F) (SEQ ID NO: 1). It is the phosphorylation of the serine in the motif, residue 139 in mammals, that yields the modified form named  $\gamma$ -H2AX.

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In the Claims:

Cancel claims 1-26.

Add the following claims:

27. A kit for determining DNA double-stranded breaks, wherein said kit comprises (i) an isolated or purified antibody or antigenically-reactive fragment thereof that binds to a C-terminal amino acid sequence of an H2A histone protein, said C-terminal amino acid sequence consisting of SQ(D/E/A)(I/L/Y/F) (SEQ ID NO:1) that comprises a phosphorylated serine, wherein the antibody or antigenically reactive fragment thereof does not detectably bind to a C-terminal amino acid sequence of an H2A histone protein, said C-terminal amino acid sequence consisting of SQ(D/E/A)(I/L/Y/F) (SEQ ID NO:1) that does not comprise a phosphorylated serine under conditions when the isolated or purified antibody or antigenically-reactive fragment thereof binds to the C-terminal amino acid sequence of an H2A histone protein, said C-terminal amino acid sequence consisting of SQ(D/E/A)(I/L/Y/F) (SEQ ID NO:1) that comprises a phosphorylated serine, and (ii) a means of facilitating detection of binding of said antibody or antigenically-reactive fragment thereof to an H2A histone protein.

28. The kit of claim 27, wherein said phosphorylated serine is about four amino acids from the C-terminus of said H2A histone protein.

29. The kit of claim 27, wherein said fragment is selected from the group consisting of Fab, Fab', F(ab')<sub>2</sub>, and F(v).

30. The kit of claim 27, wherein said H2A histone protein is mammalian.

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31. The kit of claim 30, wherein said H2A histone protein is H2AX.

<sup>32</sup>  
~~33.~~ The kit of claim 1, wherein said means of facilitating detection is an enzyme, a radioactive isotope, a fluorescent molecule, biotin, or a labeled secondary antibody that detects binding of said antibody or antigenically-reactive fragment thereof to said H2A histone protein.

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<sup>33</sup>  
~~34.~~ The kit of claim 33, wherein said labeled secondary antibody is linked to an enzyme.

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